SOURCE
ENERGIA

Storage and integration of renewables in the grid in Mozambique.

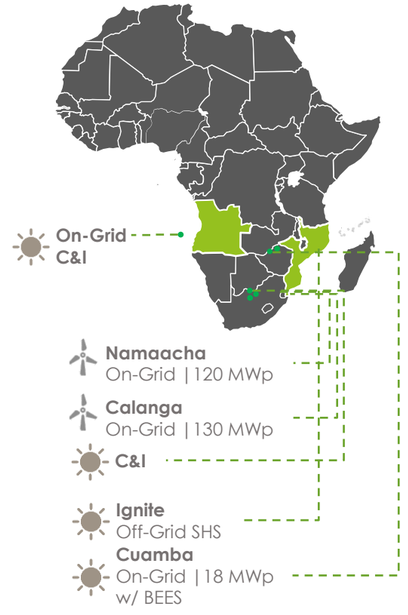
ALER Conference
Mozambique, Maputo
Indy Village

25th MAY 2022

EXECUTIVE SUMMARY – SOURCE ENERGIA

WHO WE ARE

Source Energia is a diversified renewable energy platform focused on the development, finance, construction, management and operations & maintenance of large & small scale on- & off-grid renewable energy in Lusophone Africa, with deep insight into local commercial and regulatory frameworks, know-how of current best practices for renewable energy projects, and over 70 years of combined experience.



OUR SERVICES

- Advisory Feasibility Studies
- Finance and Project Structure
- Asset Management
- Project Development
- Project Management
- Engineering and Construction
- Operation and Maintenance
- Procurement

AREAS OF EXPERTISE

- On Grid IPP
- Self Consuption / C&I
- Rural Electrification (SHS/MG)
- TESCO

OUR COMPANY EXPERIENCE IN MOZAMBIQUE

- ✓ **19 MWp** Solar + 6 MW BESS **on-grid IPP** under construction
- ✓ **22kWp** Solar Installed and in Operation, 80kWp under construction;
- ✓ **40+ MW Self Consumption / C&I** under pre-feasibility study
- ✓ **100k+ of SHS off-grid** beneficiaries growing 15k per month
- ✓ **+300 MW** wind and solar **on-grid IPP** under development
- ✓ **TESCO & MINI GRID** green field projects under development

COMPANY MILESTONES

2015

- Source Capital Founder

2017

- Mozambique Government Awarded first On-Grid IPP Projects (Solar and Wind)

2018

- Partnership with IGNITE
- Signed Implementation Agreement with MIREME for the first Rural Electrification Project and partnership with Ignite

2019

- Partnership with Globeleq for On Grid IPP

2020

- Incorporation of Source Energia;
- SOURCE opens office in Angola;
- Signs first PPA with EDM for CET 19MWp, this first lager scale with battery
- Signs JV with Globeleq and Wind Lab for Calanga Wind Power;

2021

- First financial close on On-Grid IPP
- First C&I installation

2022 E

- First construction of On-Grid IPP
- First Mini Grid development
- Start Tesco project

Angola | Mozambique | South Africa

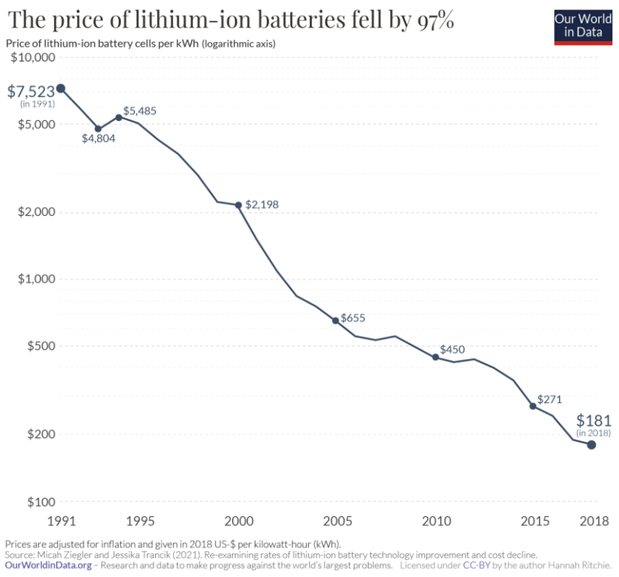
BATTERIES FOR RENEWABLE ENERGY PROJECTS

EVOLUTION OF PRICES

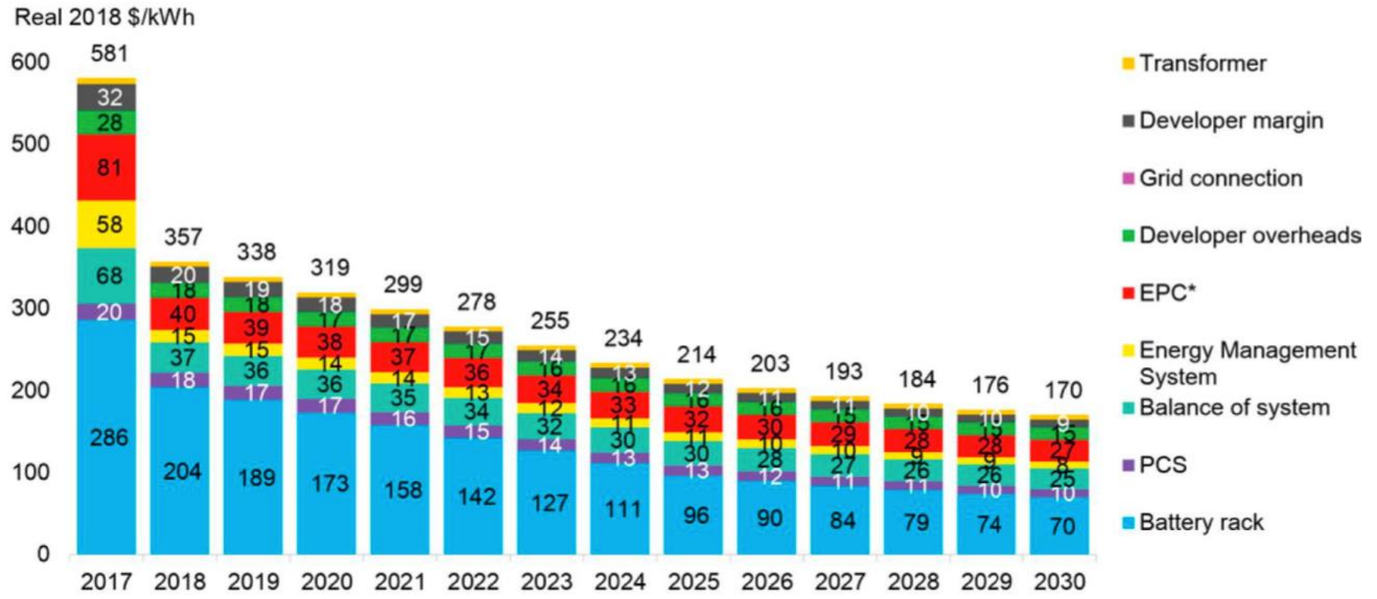
Renewables produce energy intermittently, the sun doesn't always shine, and the wind doesn't always blow, so there isn't a steady flow of generation throughout the whole day. However, there is a solution, to store excess energy in batteries to later release it, although this adds large costs to the energy system.

The prices of batteries have **declined by 97% in the last three decades.** A battery with the capacity of 1 kWh that costed $7,500 in 1991, was just $181 in 2018. Prices are still falling very steeply: the cost halved between 2014 and 2018. **Continued production and improving efficiencies are set to make prices drop below $100/kWh price by 2024.**

However, even though prices are falling over the years, batteries are still quite expensive due to their pure and limited metals. **On average, a lithium-ion battery costs $156/kWh.** Important to alert that due to COVID and UKRAINE War, some of the comoditoes price has come up but its expected that its temporary and the trend will be kept.



https://ourworldindata.org/battery-price-decline



BATTERY ENERGY STORAGE SYSTEM ("BESS") APPLICATIONS

- Flexible Peaking Resource/Resource Adequacy (Peak Shaving)
- Reserve Capital
- Energy Arbitrage
- Transmission & Distribution Deferral
- Voltage Support
- Transmission Congestion Relief
- Frequency Regulation
- Black Start

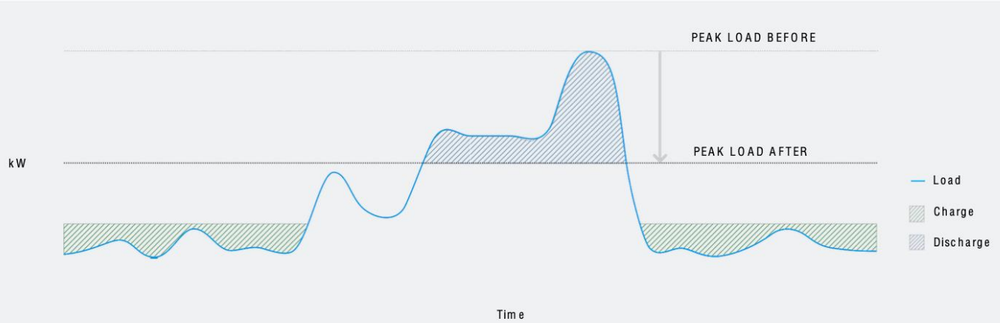
APPLICATIONS FOR GRID OPERATORS AND UTILITIES

CUSTOMER ("BEHIND-THE-METER") APPLICATIONS

- Time-Of-Use Bill Management
- Increased Self-Consumption/ Self-Sufficiency from Solar Plus Storage
- Demand Charge Reduction
- Backup Power/Uninterruptible Power Systems

BESS RECOMENDED APPLICATIONS FOR MOZAMBIQUE

PEAK SHAVING

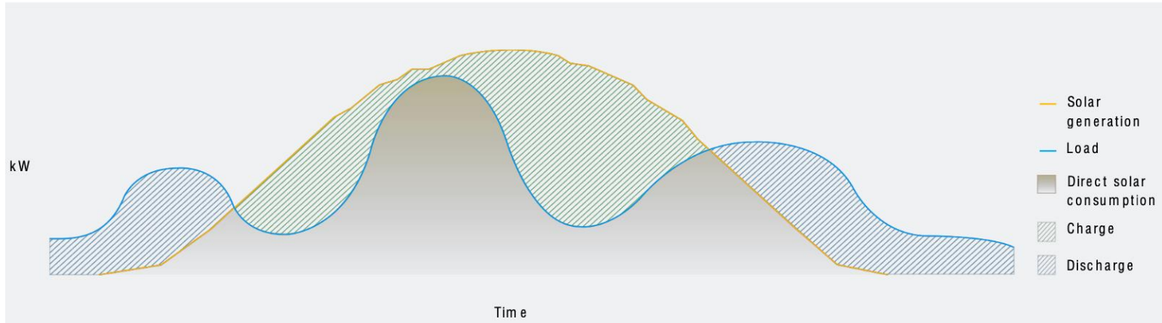


Lower peak demand charges

Reduce grid connection costs

Hedge against rising charges

RENEWABLE SELF CONSUMPTION

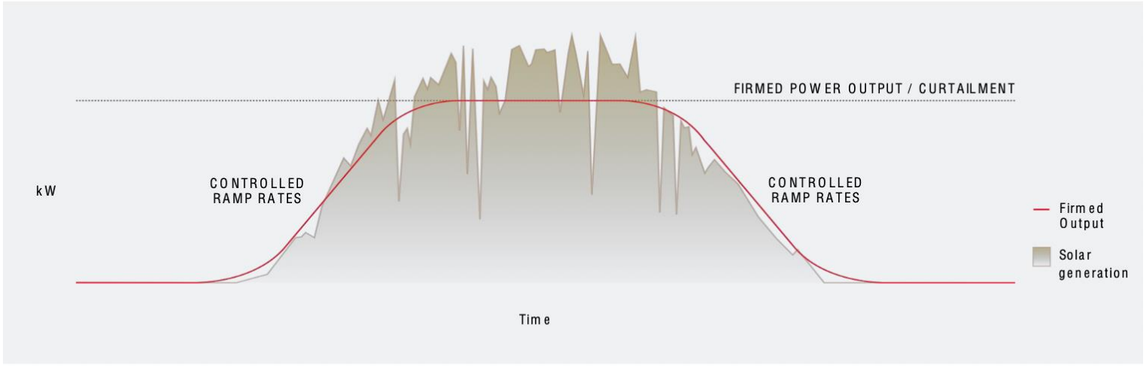


Reduce costs for energy and grid connection

Protect your business from future energy price increases

Drive sustainability and reduce CO_2 emissions

RENEWABLE FIRMING

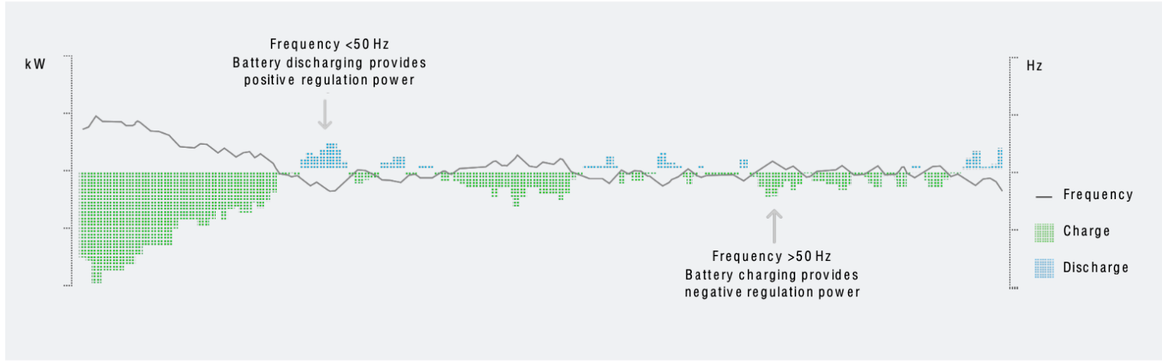


Controls ramp rates and smoothes generation profile

Enables continuous power despite fluctuations in power supply

Avoids renewable curtailment and increases energy output

ANCILLARY SERVICES



Provides reactive power control

Lowers risk of grid outage

Provides additional revenue stream

BESS OPPORTUNITIES IN MOZAMBIQUE

UTILITY SCALE GRID CONNECTED
> 5 MW

COMMERCIAL & INDUSTRIAL
Usually 1 MW - 5 MW

OFF-GRID, MINI-GRID, MICRO-GRID
Various sizes and configurations based on project needs

UTILITY SCALE GRID CONNECTED
> 5 MW

1.

- Either owned and operated by Utility or IPP
- Commonly combined with generation such as diesel, wind, solar
- Supplementing intermittent supply
- Improve network operating efficiency
- Reduce or delay network infrastructure upgrades

COMMERCIAL & INDUSTRIAL
Usually 1 MW - 5 MW

2.

- Energy arbitrage
- Renewable Self consumption for time-of-use tariffs
- Backup power during outages
- Whether PPA or owner invested
- Improve power quality

OFF-GRID, MINI-GRID, MICRO-GRID
Various sizes and configurations based on project needs

3.

- Installed in remote areas, far from grid access
- Always combined with generation, often hybrid
- Challenges related to security of investment, recovery of energy costs

FIRST LARGE-SCALE BATTERY PROJECT IN MOZAMBIQUE

CUAMBA SOLAR PROJECT 19 MWP + 6.7 MWH BESS

- A 15 Mwac Photovoltaic Solar Power Plant with Battery, is located in the District of Cuamba, Province of Niassa (“Cuamba Solar Project”), promoted by Globeleq and Source Capital.
- The project is the first large-scale solar project with battery in Mozambique, with a dimension of **18.75 MWp (15 Mwac) + E22 Energy Storage Battery 1.8 MW/6.7 MWh.**
- **The battery is supplied by E22 which** is part of Gransolar Group, they have good experience with hybrid energy and battery storage systems and appeared on the energy market scene at the end of 2014 in the electric market.
- The battery is lithium-ion technology, with15-year performance warranty and a full 10-year extended warranty against product defects.
- Its main objective will be peak power displacement in order to support Cuamba’s peak overnight load service and store energy overnight. However, it will also be able to provide other network services when needed, such as voltage frequency support.

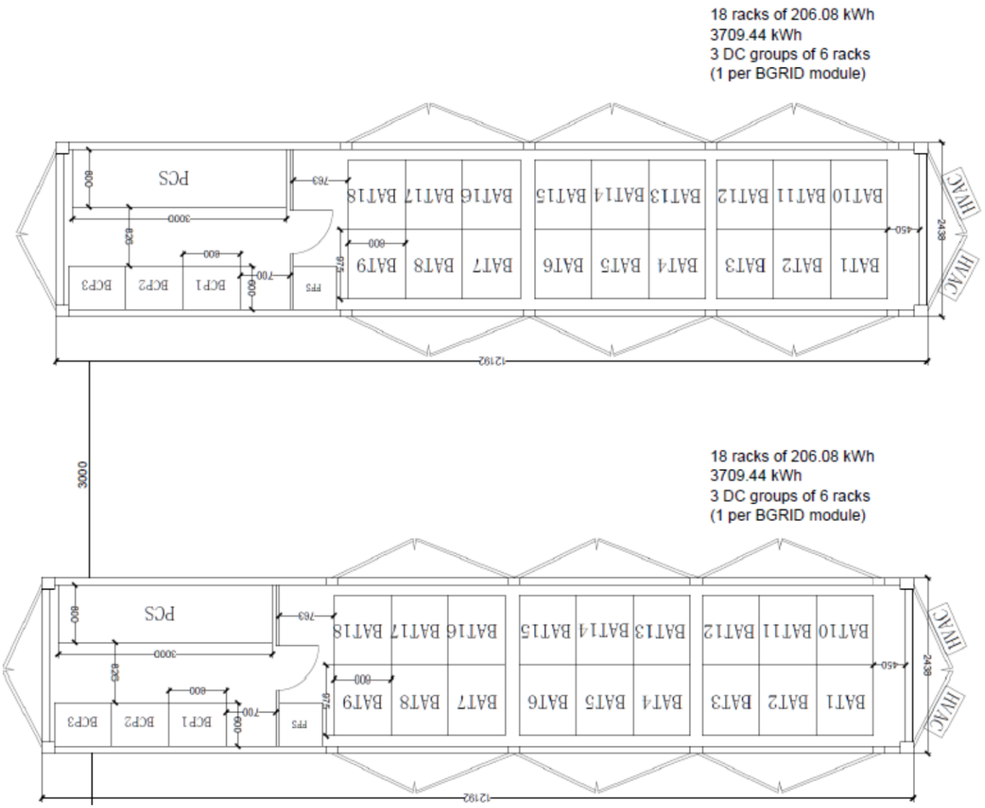
FIRST LARGE-SCALE BATTERY PROJECT IN MOZAMBIQUE

	2021				2022			
MAIN PROJECT MILESTONES	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Final Investment Decision (20th Dec 2021)	☑							
Notice to Proceed (“NTP”) for Construction of Installation of (20th Dec)	☑							
Start of Mobilization (14th Jan 2022)					☑			
Start of Mechanical Works on the Solar Plant (16th Jul 2022)					◍			
Construction of Substation (7th May 2022)					◍		◍	
Start of Substation Comissioning (30th Oct 2022)					◍			
Energization of Solar Plant (9th Nov 2022)					◍			
Start of Performance Tests (9th Dec 2022)					◍			
Plant Submission (19th Dec 2022)					◍			

FIRST LARGE-SCALE BATTERY PROJECT IN MOZAMBIQUE

THE BATTERY

BESS CONFIGURATION	
AC Installed Power	1,86 MVA
AC Installed Energy (BoL)	7,42 MWh
AC Usable Energy at Inverter Output (BoL)	6,72 MWh
Li-ion cell Technology	LFP
Li-ion cell Manufacturer	CATL
Li-ion cell Model	CATL 280Ah
Li-ion cell Power	896W
Cells per Module / Rack	10 / 230
Nominal Rack Voltage	736 V
Racks per PCS	18
Total Number of Racks	36
PCS Manufacturer	Energy Storage Solutions
PCS Model	E22 BGRID 3X
PCS Nominal Power	930 kVA
MV Power Blocks	1 power blocks: 1.860 kVA



PROJECT LAYOUT WITH BATTERIES